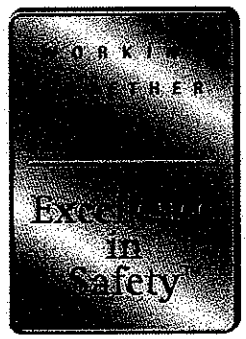
360INFUSER™

SERVICE MANUAL



Rx Only

B|BRAUN

8874 Rev C (10/03)

360INFUSER™

SERVICE MANUAL

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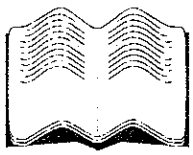
CHAPTER 1.0
INTRODUCTION



IN THIS CHAPTER YOU WILL LEARN:

- The intended use of this service manual.
- About the important features of the 360infuser pumps.
- Of warnings, cautions, and disclaimers related to the use of this manual.
- How to contact B. Braun Customer Service and Technical Support.

This manual is designed to help the biomedical engineer perform routine maintenance, basic troubleshooting, and modular repair of the B.Braun 360infuser Syringe Pump.

It is suggested that before attempting any maintenance or repair functions, review this material carefully to become familiar with the unit. This will help avoid possible damage and ensure that the 360infuser will perform dependably and accurately at all times. By accepting delivery of spare parts for the 360infuser, the party performing the installation of said components accepts responsibility for the performance of the device and, in addition, accepts any liability associated with the device incurred at the time of the repair and in the future.

Do not use the pump in the presence of strong electromagnetic fields. The field may permanently damage the pump. For further information, consult the manufacturer of the equipment in question.

To facilitate maintenance and repair, B.Braun has designed the 360infuser to include specific user-replaceable parts (see Chapter 6).

Problems and/or repairs not covered in this manual should not be attempted by the biomedical engineer, but should be referred to our Technical Service Department at B.Braun Technical Services at 1-800-627-PUMP (1-800-627-7867).

1.1 DISCLAIMERS

Due to the critical nature of product performance, B.Braun recommends that all required service on this product be performed only by an authorized B.Braun Service Center or a qualified biomedical repair professional who has attended the B.Braun service training course. Repairs should not be attempted without a current Service Manual. Repairs should not be attempted by other than qualified personnel that are knowledgeable in the areas of microprocessor controlled electronics, digital and analog circuitry, electromechanical devices, testing, static control and soldering techniques. Repairs should not be attempted which have not specifically been identified in this Service Manual.

WARNING: If the product is partially or completely disassembled, or a component or assembly has been replaced or repaired, the unit must undergo and pass all performance checks and the appropriate calibrations and/or tests as outlined in this manual prior to use for patient care. All final performance testing and calibration of the 360infuser must be performed with syringes that are acceptable for patient use with an exception for sterility only. Failure to do so may cause bodily harm and will void all warranties.

CAUTION: Rework of multi-layer boards should not be attempted unless personnel have attended and passed an accredited course in soldering techniques for this type of board and express written consent has been obtained from an authorized B.Braun Representative. Failure to do so will void all warranties.

CAUTION: Individual component replacement is not recommended and will void any and all warranties unless express written consent has been obtained from an authorized B.Braun Representative. B.Braun recommends board replacement as it may not be possible to test complete circuit function to factory specifications.

By performing any repairs with or without use of this manual as a reference, you hereby acknowledge and agree that B.Braun and its distributors shall be indemnified and held harmless from and against any and all damages, liabilities, actions or causes of action, including attorney's fees, directly or indirectly arising out of or resulting from such repairs.

You also understand that neither B.Braun nor its distributors shall be liable for any incidental or consequential loss, damage, or expense directly or indirectly arising from authorized or unauthorized repair of this device since the quality of repair, and the knowledge and experience of personnel performing repairs, as well as other factors relating to matters beyond B.Braun's control, directly affect the device and the results obtained from its use.

B.Braun neither assumes, nor authorizes any other person to assume for it, any other or additional liability or responsibility in connection with repair of this device. B.Braun accepts no financial obligations for any institution's authorized or unauthorized repair during the warranty period.

The information contained in this manual is current as of the date of issue.

1.2 INTENDED USE OF SERVICE MANUAL

This manual is intended to be used by a qualified biomedical service professional for the troubleshooting and repair of the referenced equipment. Repair of the device should only be performed by a qualified biomedical service professional. Although it is not mandatory that each service professional be certified by B.Braun prior to servicing the 360infuser, it is recommended. Please contact B.Braun, Inc.Technical Service for additional information on the training classes and fee structure. B.Braun withholds the right to sell parts to any institution until a service professional has been certified by B.Braun.

ATTENTION: This manual contains information and data proprietary to B.Braun. This information is provided solely for technical personnel in maintaining and servicing the 360infuser. None of the information contained herein may be duplicated or used in any manner other than for the maintenance and servicing of the pumps or their component parts. Any unauthorized use of the information contained herein may subject the user to substantial liability for infringement of trade secrets, copyright, and patents.

This Service Manual is organized into seven Chapters as outlined in the Contents.

Please refer to the Methods of Use section of the Operator's Guide for the intended use of this syringe pump.

Additionally, throughout this manual are icons which identify supplemental information as described below.

ATTENTION: This icon will provide additional information for a given topic in this manual.

NOTE: This icon will provide additional information for a given topic in this manual.

CAUTIONS or WARNINGS: This icon will provide safety recommendations in order to prevent accident or injury to the user or the patient.

1.3 PUMP SAFETY

1.3.1 Warnings

WARNING: To avoid electrical shock, turn the pump off before cleaning.

WARNING: If the product is partially or completely disassembled, or a component or assembly has been replaced or repaired, the unit must undergo and pass all performance checks and the appropriate calibrations and/or tests as outlined in this manual prior to use for patient care. All final performance testing and calibration of the 360infuser must be performed with syringes that are acceptable for patient use with an exception for sterility only. Failure to do so may cause bodily harm and will void all warranties.

WARNING: To avoid electrical shock, turn the pump off before cleaning.

1.3.2 Cautions

CAUTION: Rework of multi-layer boards should not be attempted unless personnel have attended and passed an accredited course in soldering techniques for this type of board and express written consent has been obtained from an authorized B.Braun Representative. Failure to do so will void all warranties.

CAUTION: Individual component replacement is not recommended and will void any and all warranties unless express written consent has been obtained from an authorized B.Braun Representative. B.Braun recommends board replacement as it may not be possible to test complete circuit function to factory specifications.

CAUTION: If during the infusion an occlusion alarm appears, the red Attention LED flashes. To deactivate the occlusion alarm, you have to press the Stop Infusion button, unlock the syringe head and, if needed, remove the syringe from the pusher.

CAUTION: To avoid mechanical or electronic damage, DO NOT steam autoclave or immerse the pump in any fluids or cleaning solutions.

CAUTION: To avoid mechanical damage, DO NOT use acetone, solutions containing glutaraldehyde, ammonium chlorides or abrasive cleaners on the instrument.

CAUTION: Sterilization of the pump using ethylene oxide (EtO) gas or Autoclaving is not recommended.

CAUTION: Do not clean the pump using high-pressure devices.

Caution: When reattaching the back case, use the three screws provided and take care not to bend or crimp the ribbon cable attached to the J1 connector or any other wires.

CAUTION: Do not compress the spring when tightening the set screw. Compressing the spring will affect the occlusion pressure readings.

CAUTION: Federal (U.S.A.) law restricts this device to sale by or on the order of a physician.

1.3.3 Attentions

ATTENTION: Refer to Operator's Guide for complete directions for use.

ATTENTION: A new syringe should be used for each test.

ATTENTION: It is very important to avoid pinching any wires between the studs or case halves when closing the unit.

ATTENTION: For all old revisions, B.Braun should remove the obsolete EPROMs.

ATTENTION: Some devices may require to desolder 34 pins of LCD connector.

ATTENTION: If the PC board displays part number PD-7790, ensure there is a jumper wire from pin 0 of the LCD connector to pin 32 of the display driver U5.

ATTENTION: Some units may have the buzzer mounted to the chassis. In this case, remove the screw holding the damaged buzzer in place, discard the buzzer, and install the new buzzer in the same location. Cut off one of the new buzzer's mounting arms for fit.

ATTENTION: If you can not remove the .035" set screw, pry the gear off with a pair of pliers.

ATTENTION: This manual contains information and data proprietary to B.Braun. This information is provided solely for technical personnel in maintaining and servicing the 360infuser. None of the information contained herein may be duplicated or used in any manner other than for the maintenance and servicing of the pumps or their component parts. Any unauthorized use of the information contained herein may subject the user to substantial liability for infringement of trade secrets, copyright, and patents.

1.4 THEORY OF OPERATION

The 360infuser is a microprocessor controlled, battery operated, portable syringe pump used to administer intermittent infusions. The pump accepts syringe sizes ranging from 3cc to 60cc, and is capable of delivery times ranging from 10 to 60 minutes.

The unit's Power On button activates an automatic system check. During this self- test, all indicator lights are sequentially activated as are the LCD bars, the buzzer tone sounds, and the battery voltage is read (internal to the unit, not displayed). When this system check has been completed, the unit automatically presets the timer at 30 minutes, displaying the first 12 bars of the LCD.

After a syringe has been placed in the pump and the time has been set, the unit calculates the proper infusion speed and occlusion pressure. To perform these calculations, the unit first determines the syringe diameter, the pusher block position, and the clamp block position, then determines the period and width of motor impulses to govern the plunger speed until the infusion has been completed, the Stop Infusion button has been pressed, or an alarm condition has been detected and the Stop Infusion button has been pressed.

The occlusion mechanism is contained within the syringe clamp and operates by depressing the syringe clamp against an internal spring. The occlusion wiper constantly monitors the displacement resulting from the pressure on the spring. If the displacement exceeds the value established in the product specification, the Occlusion Alarm is activated. The unit will automatically interrupt the infusion, activate an audible alarm, and turn both the motor and the timer off. When the infusion is restarted, the unit will ignore the initial calculations, and will reset all variables used to calculate the infusion parameters (except occlusion pressure). You have to remove the syringe from the pusher to reset the occlusion pressure to zero.

1.5 SPECIFICATIONS

Accuracy (Delivery Time)	+/- 3% using Becton-Dickinson filled 5cc to 60cc syringes[a] +/- 5% using Becton-Dickinson filled 3cc syringes[a]
Power Supply	Four C-size alkaline batteries.
Battery Life	Four hundred hours, with a minimum of 10 hours remaining after the Low Battery light has been activated.
Infusion Delivery	Delivery time may be set from 10 to 60 minutes, in 2.5 minute increments. Volumetric rate may be set between 1.5 ml/hr and 360 ml/hr, depending upon syringe size.[b]
Size	15" x 9.75" x 2.75"
Weight	Approximately 2 lb. including batteries.
Alarms: Blinking Red Attention Light and Beeping Alarm Beeping Alarm When Infuse Button is Pressed Flashing Time Scale, Blinking Attention Light, and Beeping Alarm Low Battery Light	Occlusion, Removed Syringe, Dislocation of Syringe Plunger Delivery Time Out of Range No Movement of Syringe Driver or Electronic Malfunction Low Battery

a. Accuracy data derived in accordance with Association of Advancement of Medical Instrumentation "Standard for Infusion Devices, when used with nominal B-D Plastipak™ syringes.
b.Certain low volume/high delivery time combinations are beyond the range of the pump. Should the user select a time of infusion outside the pump's range, an alarm will beep twice when the Infuse button is pressed.

1.6 TRACKING

United States Federal Law requires tracking of this device. Institutions or persons acquiring this device must report the receipt of this device to the manufacturer, report the sale of this device to another institution or party, maintain adequate records which track the device during short-term home patient placements, and report the device's purchase, trade-in, return, loss, or destruction.

1.7 SERVICE & PERFORMANCE INFORMATION

If the pump fails to respond to the operating or troubleshooting procedures listed in this manual, and the cause cannot be determined, discontinue using the pump.

Service and product performance information may be obtained from the manufacturer by contacting:

B. Braun Medical Inc.
1601 Wallace Drive, Suite 150
Carrollton, Texas 75006
Attn.: Manager of Service
(800) 627-PUMP
(800) 627-7867

Product complaints may be sent to the Manager of Quality Assurance at the above address. With each complaint, please include the serial number or lot number of the product involved, a description of the difficulty experienced, information regarding the time setting, syringe size and volume, the type of I.V. fluid in use, the alarms displayed at the time the difficulty occurred, and any other information which might aid in the investigation of the complaint.

Should it be necessary to return the pump to the manufacturer, carefully pack the pump (preferably in the original packing), and ship it prepaid to the above address. The manufacturer cannot assume any responsibility for loss or damage to returned instruments while they are in transit.

Authorization to return products must be received from B.Braun prior to shipment. Please contact Customer Service at the above phone number for a Returned Goods Authorization Number.

With each question or complaint, please include the:

- pump's serial number
- description of the difficulty experienced
- initial volume to be infused
- type of fluid
- amount of time between the start of the infusion and the time the difficulty was noticed
- alarms displayed at the time the difficulty occurred
- catalog and lot number of the set(s) in use.

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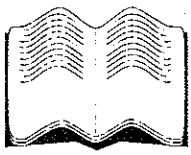
CHAPTER 2.0
RECEIVING PROCEDURE



IN THIS CHAPTER YOU WILL LEARN:

- How to properly receive in a pump.
- How to perform a receiving inspection.
- What procedures to follow when checking in a pump.
- Of the system displays and alarms and their indications

2.1 INTRODUCTION

2.1.1 Notices

If the product is partially or completely disassembled, or a component or assembly has been replaced or repaired, the unit must undergo and pass all performance checks and the appropriate calibrations and/or tests as outlined in this manual prior to use for patient care. All final performance testing of the 360infuser must be performed with a syringe that is acceptable for patient use with an exception for syringe sterility only. Failure to do so may cause bodily harm and will void all warranties.

2.1.2 Damaged Goods

Upon receipt, count and inspect your freight before the carrier departs. Damaged merchandise should not be accepted. Identify any items that are damaged or lost, and have the extent of the damage or loss noted on the customer's copy of the delivery document by an agent of the transportation company. If damage is discovered after receipt of shipment, notify the transportation company immediately, and request that inspection be made and an inspection report rendered. B.Braun will be happy to issue a credit for the loss or damage, and file a claim with the carrier, providing your request and the carrier's freight bill indicating the item and quantity damaged or not received are promptly forwarded to the Carrollton, Texas office (see Section 1.7), and received within ten days. The claim request must be accompanied by a delivery receipt or an inspection report upon which the transportation company has properly noted such damage or loss.

2.1.3 Goods Received in Error

Items ordered or shipped in error may be returned to the warehouse provided Customer Service is notified (see Section 1.7), and the products are returned within 14 days. Items ordered in error must be returned freight prepaid by the customer.

Credit will be issued for all returns for goods received in error provided:

- Proper authorization has been obtained (refer to Section 1.7),
- Products are in the original undamaged cases, suitable for immediate resale,
- Products are current inventory items, and
- Merchandise has been shipped and billed to the customer by B. Braun.

Certain products are not eligible for return for credit. These are:

- Products which have been used.
- Products whose labels or seals have been tampered with or removed.

Except in the case of a B. Braun error, items must be returned freight prepaid by the customer.

2.1.4 Late Shipments

B.Braun shall be excused from any delay, or impossibility of performance, due to any cause beyond its or its suppliers' or subcontractors' control, including, but not limited to: acts of God, war, acts of government, acts of purchase priorities or allocations, raw material shortages, fire, flood, strike, labor trouble, sabotage or delay in obtaining labor, materials, equipment, or transportation.

2.1.5 Expedited Shipments

When expedited transportation, specialized services, or alternate transportation modes are specified by the customer, an additional charge to cover the premium expense will be added to the invoice.

2.2 RECEIVING INSPECTION

Each 360infuser is factory tested and inspected prior to its final packaging and shipment. There is, however, the possibility of in-transit damage which may or may not be obvious; therefore, the following inspection is recommended. If functional testing is required upon receipt by your (customer) policy, refer to Chapter 3.0 "Simulated Use and Performance Checks."

1. Before opening the shipping container, inspect it carefully to assure the absence of obvious damage. If damage is present, notify the freight carrier immediately, and wait to open the container until a representative of the shipping company is present. (It is difficult to place responsibility for shipping damage after the shipping container is opened). Do not return damaged equipment to the manufacturer unless specifically authorized to do so by the company, whether or not the company is responsible for the repair.
2. Carefully remove the pump from the shipping carton. Retain the packaging materials in case the pump ever has to be shipped for repair.

3. Carefully inspect the pump for dents, scratches, missing parts, or any other obvious signs of shipping damage
4. Make sure the pusher block of the pump slides up and down easily.
5. Make sure there are no visible dents, tears or scratches on the pump membrane panel.
6. Check the pole clamp for ease of operation.

2.3 OPERATING PROCEDURE

Refer to the 360infuser Operator's Guide for complete operation instructions.

1. Press the 360infuser Power On button. The system will perform an electronic self-test, displaying all 24 LCD time bars and all 4 LEDs, one at a time. When this test has been completed, the time scale is automatically set at 30 minutes.
2. Move the Pusher Block to the top of the unit by pulling the Plunger Lock as far as possible away from the unit, then slide the entire Pusher Block upwards.
3. Insert the filled syringe in the Syringe Clamp, making sure the rim of the syringe barrel is positioned in the clamp notch.
4. Once again, pressing on the Pusher Block and pulling the Plunger Lock back, slide the Pusher Block down until it catches the rim of the syringe plunger. Make sure the plunger rim is positioned between the plunger lock notch and the syringe driver notch.
5. Set the delivery time using the Increase or Decrease buttons. The top bar on the screen indicates the established delivery time throughout the infusion.
6. If an audible tone at the end of the infusion is desired, perform the following (depending upon the pump version):
    - For units with the Infusion Complete Tone On or Infusion Complete Tone without the bell symbol in the LCD, press the Infusion Complete Tone On or Infusion Complete Tone button (these versions operate identically) before the infusion begins. To determine if the audible alarm had been selected after the infusion begins, press the Infusion Complete Tone (On) button and, if a beep sounds and the Infusion Complete light stays on as long as the button is pressed, then the audible alarm signalling the end of the infusion has been activated. To activate this alarm after the infusion has begun, press the Stop Infusion button, then press the Infusion Complete Tone (On) button, and finally, press the Infuse button (to continue the infusion).
    - For units with the bell symbol in the display and the Infusion Complete Tone (On) button, press the Infusion Complete Tone (On) button. The presence or absence of the bell symbol's appearance in the display indicates whether this alarm is activated or not.
    - For units with no bell symbol in the display and the Alarm Tone Off button, press the Alarm Tone Off button to disable all audible alarms for one minute after their activation.

7. To begin infusion, press the Infuse button. During the infusion, the green Infuse indicator light and the top bar for the time that has been set will both flash. As the time scale counts down, one bar below the top bar will disappear every 2.5 minutes.
8. The Infusion Complete light will blink when the infusion has been completed.
9. An infusion may be stopped at any time by pressing either the Power Off button or the Stop Infusion button. The Stop Infusion button allows the operator to resume the infusion without altering the original time setting.

CAUTION: If during the infusion an occlusion alarm appears, the red Attention LED flashes. To deactivate the occlusion alarm, you have to press the Stop Infusion button, unlock the syringe head and, if needed, remove the syringe from the pusher.

10. To reset the delivery time after the infusion has begun, press the Stop Infusion button, then press the appropriate Increase or Decrease Time Set button. Restart the infusion by pressing the Infuse button.

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2.4 DISPLAYS AND ALARMS

Blinking Green Infuse Light

Indicates an infusion is in progress.

Blinking Red Attention Light and Beeping Alarm

Indicates an occlusion in the IV set, the syringe has been removed, or the syringe plunger has been moved up or down during an infusion. In these instances, the Syringe Driver stops, and the Stop Infusion button must be pressed to deactivate the alarm.

Beeping Alarm When Infuse Button is Pressed

Indicates the set delivery time is out of range for the syringe size, or the syringe is not properly placed.

Yellow Low Battery Light

Indicates a minimum of 10 hours remains in the battery (after the light has first been activated). Complete the infusion in progress and replace the batteries.

Red Infusion Complete Light

Signals the end of the infusion.

Infusion Complete Tone

Provides an audible signal at the end of the infusion.

Flashing Time Scale, Blinking Attention Light, and Beeping Alarm

Indicates no movement of the Syringe Driver or an electronic malfunction. In certain units, this may indicate that the syringe was removed from the clamp while the unit was infusing. The unit should be sent to Biomedical Engineering.

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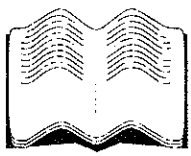
CHAPTER 3.0

SIMULATED USE AND PERFORMANCE CHECKS



IN THIS CHAPTER YOU WILL LEARN:

- What equipment is required to perform the Simulated Use and Performance Checks.
- How to perform the Simulated Use and Performance Checks.

3.1 INSPECTION PROCEDURE

The following inspection procedure permits testing of the 360infuser without opening the unit's case. This procedure may be used for periodic inspection. It should be performed as a diagnostic procedure and at the completion of every repair. Record all data for this section.

3.1.1 Equipment Required

- **Stopwatch** (the longest test will be approximately 1 hour. Resolution should be at least 1 second).
- **Pressure meter** (0-50 psig minimum range, with 0.1 psig resolution).
- **Syringes** (Becton Dickinson Plastipak™ 3cc, 5cc, 10cc, 20cc, 30cc, and 60cc).
- **B.Braun Cat. No V6512 Extension Set** (60 inch microbore tubing set).
- **Three way stopcock** with luer fittings.

3.1.2 Unit Initialization Test

1. Install batteries. Do not place a syringe in the clamp.
2. Press Power Off button.
3. Press Power On button. Observe the following sequence of events:
   - Beep is activated once.
   - Each segment of LCD bar graph is activated except for one indicating ZERO minutes.
   - Each LED flashes in order from bottom to top.
   - The LCD bar graph indicates 30 minutes.
   - On some units, the bell symbol appears within the ZERO bar. (If the unit has the bell symbol, instructions pertaining to its function appear on the rear case label.)
4. Press Infuse button with no syringe in place.
   - Observe double beep.
   - Unit does not infuse.

3.1.3 Infusion Complete Tone Test

1. Place an unfilled 10cc syringe in the clamp, set the time to 30 minutes, and press the Infusion Complete Tone (On) button (if applicable).
   - Observe single beep.
   - On some units, observe bell symbol disappears in ZERO bar.
2. Press Infuse button.
   - Observe single beep.
   - Observe green Infuse LED blinking.
   - LCD display activated.
3. Press Power Off button.
   - Observe all displays and lights turn off.

3.1.4 Occlusion Test

ATTENTION: A new syringe should be used for each test.

See Figure 3-1 for pressure meter set up description.

1. Place a 3cc syringe filled with 3.0 cc of water into position in the clamp block and pusher block.

   Do not push down on the syringe using pusher block; a loose mounting is desired.

2. Press Power On button.
3. Set the delivery time for 10 minutes.
4. Connect the pressure meter to the syringe through a 3-way stopcock and a B.Braun Extension Set (Cat. No V6512).
5. Advance the pusher toward the clamp until 2 or 3 drops of water appear at the end of the 3-way valve (all air is out of the system) and zero relative pressure is applied to the meter (to zero the system).
6. Close the vent valve and zero-out the meter.
7. Press Infuse button.
8. When the system detects an occlusion:
   - the Attention LED flashes,
   - the alarm beeps, and
   - the motor stops running.

These events should occur when the pressure reading is between **20.0 and 46.8 psig**.

9. Press Power Off button.
10. Repeat 1-9 using 60cc syringe filled with 60 cc of water. The occlusion alarms (blinking Attention LED, multiple beeps, and unit shutdown) should occur when the meter reads between **5.0 and 13.2 psig**.
11. Press Power Off button and disconnect the unit from the test apparatus.

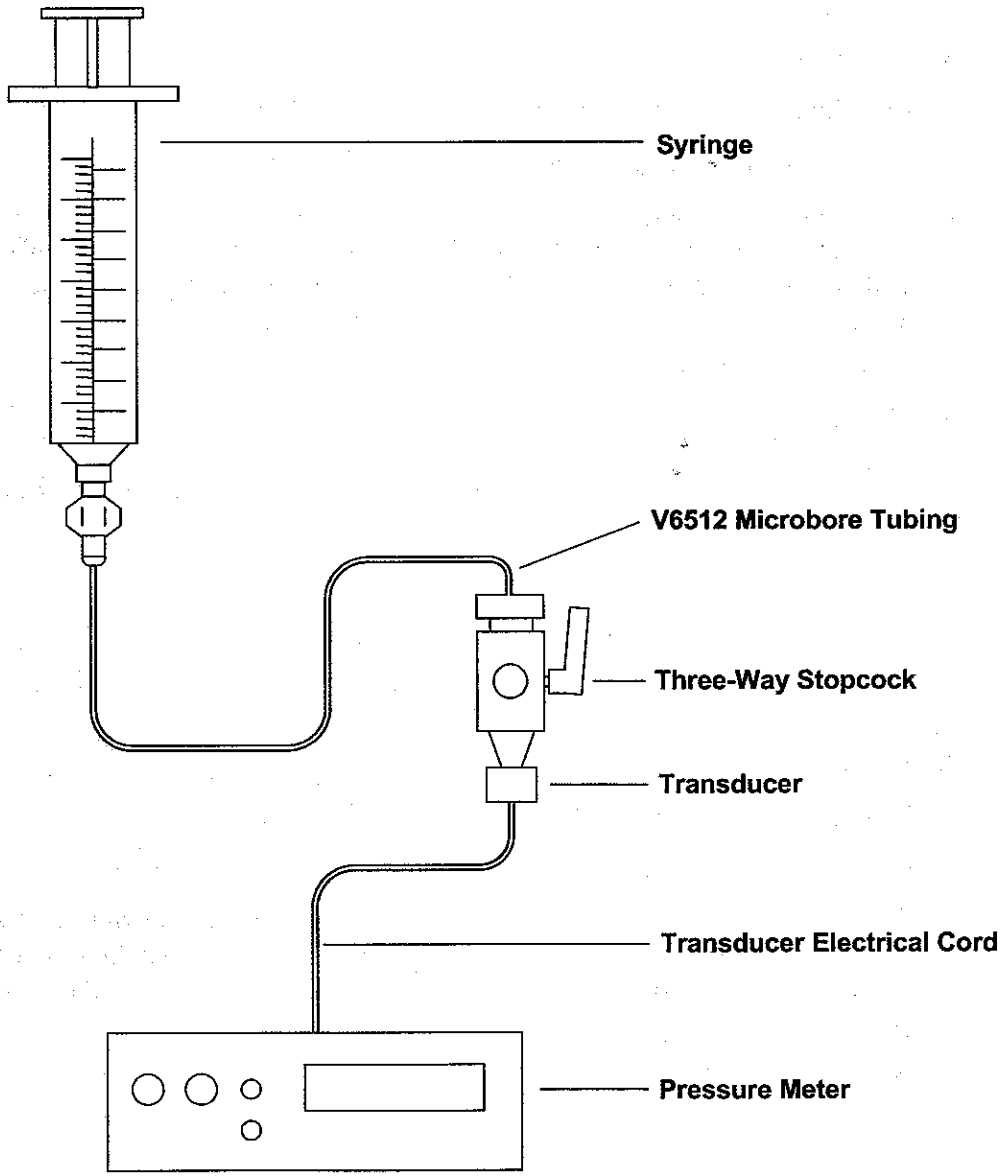


Figure 3-1:Occlusion Test, Pressure Meter Setup

3.1.5 Time Test

3.1.5.1 High Speed

1. Insert an empty 60 cc syringe with plunger extended to 60 cc into the syringe clamp.
2. Press Power On button.
3. Set delivery interval to 10 minutes by pressing Time Set Down button. Observe the LCD bar graph decrease with one beep for every incremental decrease.
4. Set the stopwatch to zero.
5. Press Infuse button and start the stopwatch at the same time.
6. Observe flashing green LED and downward motion of plunger.
7. **At the moment when the syringe bottoms out** (do not wait for an Infusion Complete alarm) the stopwatch should read between **9 minutes 42 seconds and 10 minutes 18 seconds**. Look for the stopper pressing against the angled part of the syringe tip as an indicator of the syringe bottoming out.
8. Press Power Off button.

3.1.5.2 Low Speed

1. Insert a new, empty 5cc syringe with plunger extended to 5 cc into the syringe clamp.
2. Press Power On button.
3. Set delivery interval to 60 minutes by pressing Time Set Up button.
   - Observe the LCD bar graph increase one beep for every incremental increase.
4. Set the stopwatch to zero.
5. Press Infuse button and start the stopwatch at the same time.
6. Observe the flashing green LED and downward motion of plunger.
7. **At the moment when the syringe bottoms out** (do not wait for an Infusion Complete alarm) the stopwatch should read between **58 minutes 12 seconds and 61 minutes 48 seconds**. Look for the stopper pressing against the angled part of the syringe tip as an indicator of the syringe bottoming out.
8. Press Power Off button.

Data Sheet for Testing 360*infuser*

Serial Number		
Tested By		
Dept./Location		
Date		
Test	Pass	Fail
Unit Initialization		
Infusion Complete Tone		
Occlusion - 3 cc _____ psi (20.0 to 46.8 psi)		
Occlusion - 60 cc _____ psi (5.0 to 13.2 psi)		
High Speed (time test) ____ mins ____ secs (9min,42secs to 10min,18secs)		
Low Speed (time test) ____ mins ____ secs (58min,12secs to 61min,48secs)		
Comments:		

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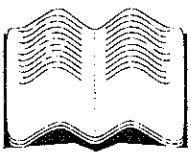
CHAPTER 4.0
CLEANING & DISINFECTING



IN THIS CHAPTER YOU WILL LEARN:

- Recommended cleaning solutions and procedures.

Clean the pump with a swab or soft, lint-free cloth dampened (not saturated) with any of the following recommended solutions:

- Household Bleach and 90% Water
- Isopropyl Alcohol
- Warm Soapy Water

Once the infusion pump is cleaned, wipe the entire pump twice with fresh water using a soft, lint-free cloth to remove all remaining cleaner/disinfectant. Thoroughly dry the instrument with a soft, lint-free cloth.

Please refer to the hospital's housekeeping, central service, or infection control department for further information.

WARNING: To avoid electrical shock, turn the pump off before cleaning.

CAUTION: To avoid mechanical or electronic damage, DO NOT steam autoclave or immerse the pump in any fluids or cleaning solutions.

CAUTION: To avoid mechanical damage, DO NOT use acetone, solutions containing glutaraldehyde, ammonium chlorides or abrasive cleaners on the instrument.

CAUTION: Sterilization of the pump using ethylene oxide (EtO) gas or Autoclaving is not recommended.

CAUTION: Do not clean the pump using high-pressure devices.

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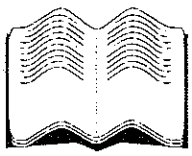
CHAPTER 5.0
TROUBLESHOOTING



IN THIS CHAPTER YOU WILL LEARN:

- The main assemblies of the pump and their location.
- General troubleshooting procedures.

This chapter provides detailed information regarding the mechanical and electrical configuration of the 360infuser. The General Troubleshooting Guide detailed in Section 5.1 is designed to aid the bioengineer in pinpointing problems and their sources. Once the problem has been identified, Chapter 6 of this manual provides information on ordering and procedures for replacement and repair.

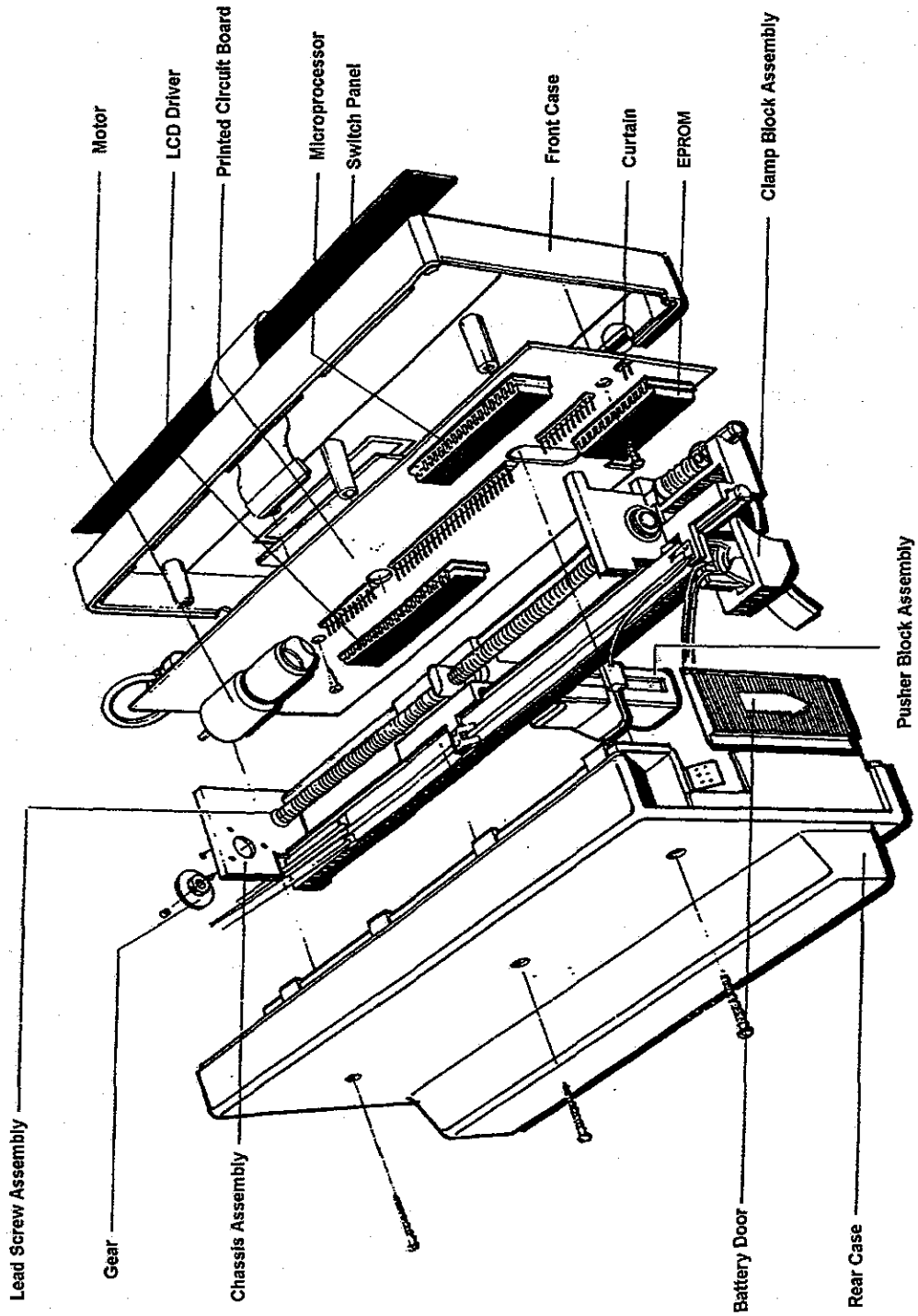
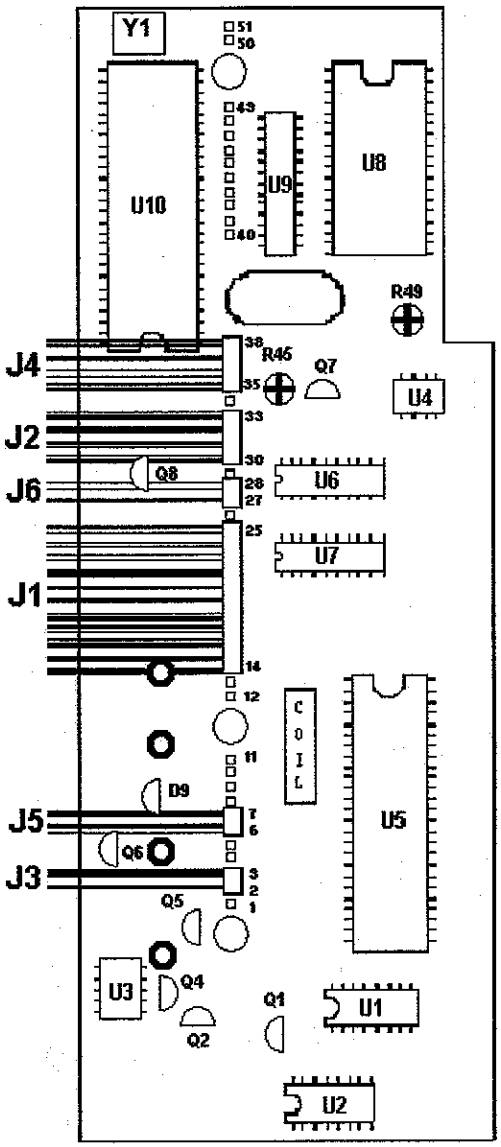


Figure 5-1: Exploded View



KEY			
Connector	Controls	Pin on PC Board	Wire Color
J1	Switch	Pin 14 to	Ribbon Cable
	Panel	Pin 25	
J2	Clamp	Pin 30	White/Blue
	Block	Pin 31	White/Yellow
		Pin 32	White/Green
		Pin 33	White/Red
J3	Power	Pin 2	Red
		Pin 3	Black
J4	Resistor	Pin 35	Green
	Strip	Pin 36	Yellow
		Pin 37	Orange
		Pin 38	Brown
J5	Motor	Pin 6	Red
		Pin 7	Red/Black
J6	Alarm	Pin 27	Orange
		Pin 28	White

Figure 5-2: PC Board

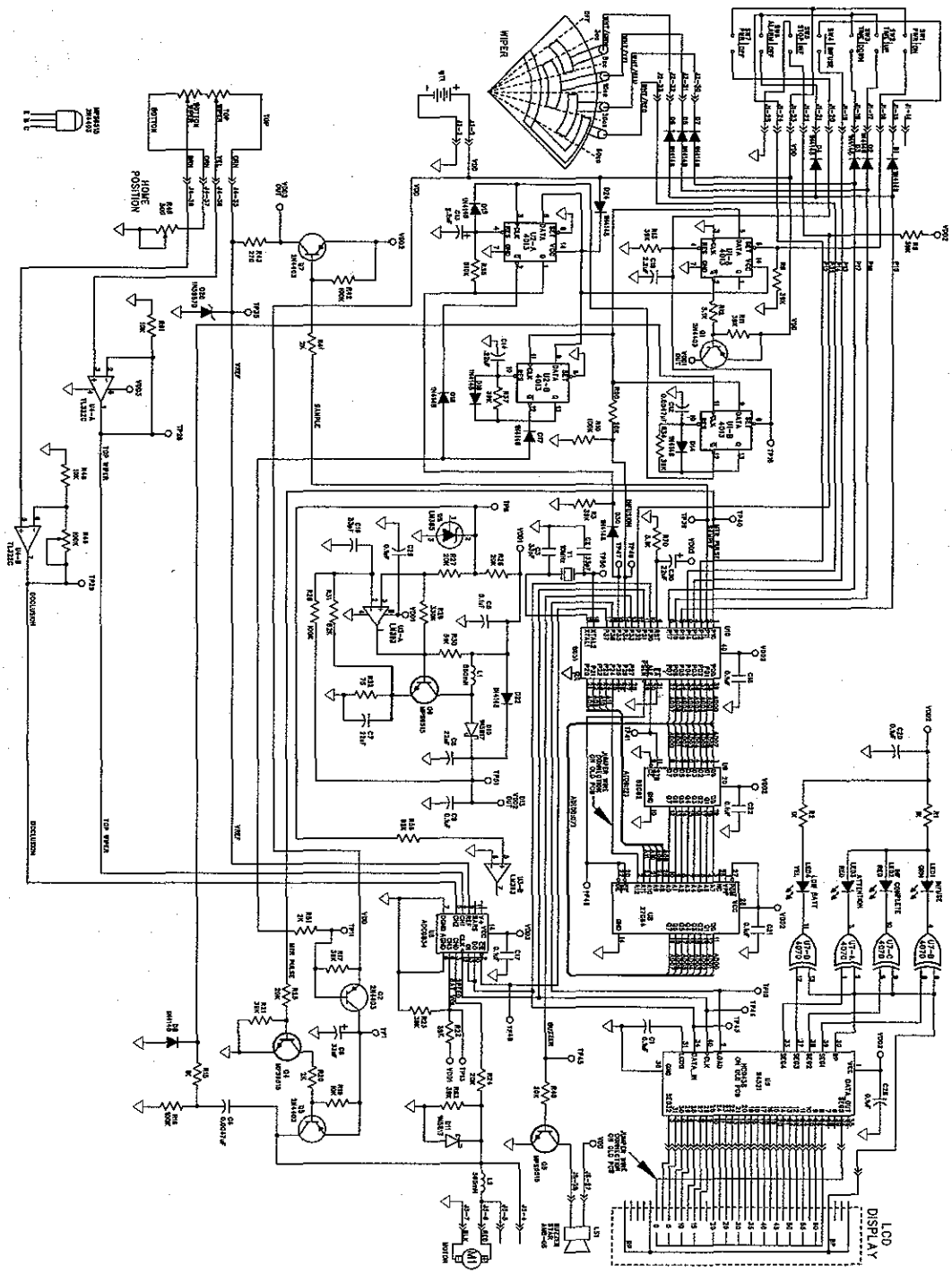


Figure 5-3: Electrical Schematic

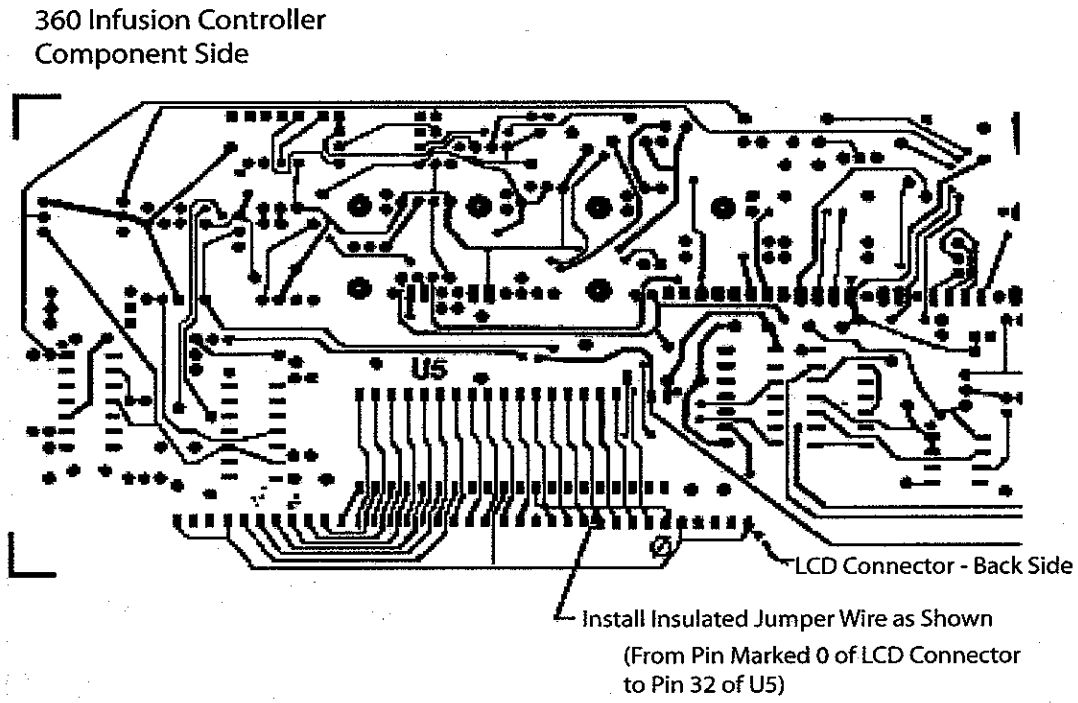

360 Infusion Controller
Component Side
U5
LCD Connector - Back Side
Install Insulated Jumper Wire as Shown
(From Pin Marked 0 of LCD Connector
to Pin 32 of U5)

Figure 5-4: Infusion Controller, Component Side

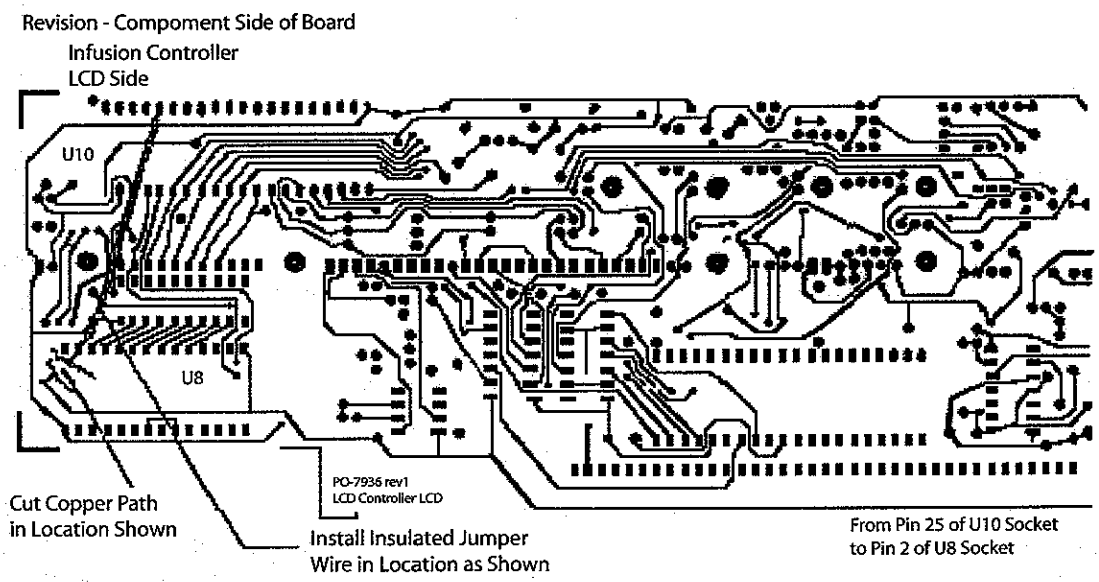


Figure 5-5: Infusion Controller, LCD Side

5.1 GENERAL TROUBLESHOOTING GUIDE

Problem	Possible Causes
On key is pressed, but nothing happens	• Check batteries • Check membrane switch • Check membrane switch is in correct position on PC board
LCD indicators light, but tones do not sound	• Check buzzer • Check voltage level at connector • Check transistor (Q8)
Not all LCD indicators light	• LCD shifted • LCD driver (U5) or LCD require replacement
One or more LED indicators do not function	• Check LED • Check LED driver (U7)
LCD timer does not automatically set to 30 minutes at end of system check.	• Check microprocessor (U10) and EPROM (U8)
Displays are erratic	• Check placement and seating of EPROM (U8) • Check seating of the microprocessor (U10) • LCD shifted or poor contact at the connector
LCD time display does not move in accordance with Time Set keys	• Check membrane switch is plugged into board properly
Tone does not sound at the end of infusion	• Determine if INFUSION COMPLETE Tone (On) was activated or INFUSION TONE (Off) activated. • Check membrane switch
No tone is sounded when START key is pressed	• Check membrane switch
Multiple tones sound when START key is pressed	• Check syringe placement • Check syringe clamp switch • Check wiring from clamp switch
Alarm sounds within a few seconds of starting an infusion	• Check syringe for presence of occlusion • Check occlusion circuit and wiper • Check plunger driver wiper and contact with potentiometer strip • Adjust clamp assembly

Infusion starts and functions normally but alarm sounds and all displays flash, after approximately 15 minutes	• The mechanical drive is not functioning properly. • Check motor and drive train • Check plunger driver and its engagement with drive train
Infusion time delivery is inaccurate	• Conduct alignment procedure. If unable to properly align, contact B.Braun Technical Services 800-627-7867.
All indicators blink and alarm tone sounds immediately upon starting an infusion	• Condition is the result of an internal electronics failure. Contact B.Braun Technical Services 800-627-7867.
Upon power up LCD locks at 60 minutes with continuous alarm	• Check placement and seating of EPROM (U8) • Check seating of the microprocessor (U10) • Replace crystal (Y1) if necessary
Attention alarm sounds and there is no occlusion present.	• The syringe was removed while an infusion was in progress.

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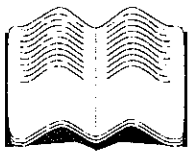
CHAPTER 6.0
REMOVAL AND INSTALLATION PROCEDURES



IN THIS CHAPTER YOU WILL LEARN:

- What tools/equipment are required to repair the pump.
- How to repair and/or replace the major subassemblies of the pump.
- What Subassembly and Repair Service Kits are available
- What tests are required after each repair.

In order to replace any component or assembly (except for the instruction label), the unit must be opened. The batteries should be removed prior to opening the pump case. The Alignment Test Procedures and the Occlusion Adjustment Procedure must be performed on every unit that is opened. In addition, the test procedures pertaining to delivery time, detailed in Chapter 3, should be performed on every unit.

ATTENTION: It is very important to avoid pinching any wires between the studs or case halves when closing the unit.

See the following pages for information on how to order the correct parts for the different versions of the 360*infuser*™.

To Order:

Call your authorized B.Braun Customer Service representative. Have the Catalog Number, revision, and quantity information available as well as a Purchase Order number.

For information regarding spare parts and repair, call B.Braun Technical Service at 1-800-627-PUMP (1-800-627-7867).

6.1 SUB ASSEMBLY AND REPAIR SERVICE KITS

Cat #	Description
FZ8850	Front Case Assembly
FZ8851	Pusher Block
FZ8852	Display Driver
FZ8853	Curtains
FZ8854	Rear Case Assembly
FZ8856	Motor with Gear
FZ8861	Microprocessor
FZ8862	LCD
FZ8863	Wired Battery Terminal
FZ8864	Battery Door
FZ8865	Split Ring
FZ8867	Buzzer
FZ8868	Clamp Block
FZ8871	PC Board Rev2
FZ8872	Crystal
8874	Service Manual
FZ8877	EPROM Rev 7
FZ8898	Pole Clamp
FZ8899	Rear Label Rev 7
8900	Operation Guide
FZ401073	Home Position Alignment Spacer (Tool)
FZ0044	Kit, Boot Installation

6.2 ASSEMBLY REPAIR INSTRUCTIONS

6.2.1 Front Case Assembly

6.2.1.1 Materials

- 1 Front Case Assembly
- 2 Curtains
- 1 Battery Door with Positive Battery Terminal
- 3 No 6 Case Screws

6.2.1.2 Procedure

1. Remove the instruction label from the back case.

   The label should be removed cleanly and completely in order to prepare the case for the replacement label that will be applied at the completion of this procedure. A heat gun is useful in removing the label.

2. Remove batteries.
3. Remove the 3 back case screws.
4. With the pump lying on its face, remove the back case.
5. Remove:
   - the buzzer connector at J6, and
   - the power connector at J3.
6. Remove the chassis by disconnecting:
   - the motor connector at J5,
   - the switch panel connector at J1,
   - the clamp block connector at J2, and
   - the resistor strip connector at J4.

   Set the chassis aside.
7. Remove the 2 screws that hold the PC board in place.

   Set the PC board aside.

   Discard the damaged front case.
8. Attach the curtain to the new front case.
9. Reinstall the PC board into the front case.
10. Reinstall the chassis.
11. Reconnect the:
    - motor connector at J5 with the red lead towards motor,

- the switch panel connector at J1,
- the clamp block connector at J2, and
- the resistor strip connector at J4.

12. Reconnect:
    - the buzzer connector at J6, and
    - the power connector at J3, with the orange and red leads of both connections towards motor.
13. Proceed to Chapter 7 for Calibration procedures.
14. Attach the back case while holding the battery door in its channel for positioning.

Caution: When reattaching the back case, use the three screws provided and take care not to bend or crimp the ribbon cable attached to the J1 connector or any other wires.

15. Replace batteries (ordered separately).
16. Proceed to Chapter 3 for Simulated Use and Performance Checks.

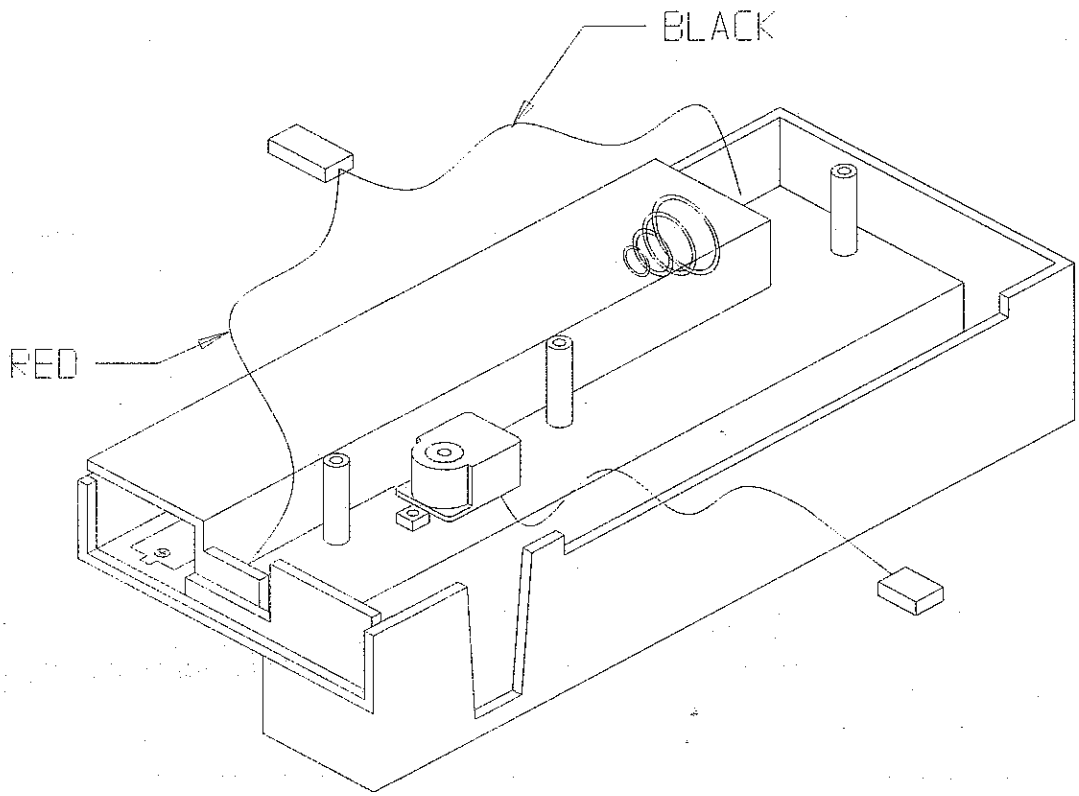


Figure 6-1: Back Case

6.2.2 Split Ring and Retainer

6.2.2.1 Materials

- 1 Split Ring with Ring Retainer

6.2.2.2 Procedure

1. Remove the instruction label from the back case.

   The label should be removed cleanly and completely in order to prepare the case for the replacement label that will be applied at the completion of this procedure. A heat gun is useful in removing the label.

2. Remove batteries.
3. Remove the 3 back case screws.
4. With the pump lying on its face, remove the back case.
5. Remove any broken pieces of the ring retainer from inside the pump.
6. Place the ring retainer between the 2 case halves.
7. Proceed to Chapter 6 for Calibration procedures.
8. Attach the back case while holding the battery door in its channel for positioning.

Caution: When reattaching the back case, use the three screws provided and take care not to bend or crimp the ribbon cable attached to the J1 connector or any other wires.

---

9. Attach a new instruction label (order separately).
10. Replace batteries.
11. Proceed to Chapter 3 for Simulated Use and Performance Checks.

6.2.3 Curtains

6.2.3.1 Materials

- 2 Curtains

6.2.3.2 Procedure

1. Remove the instruction label from the back case.

   The label should be removed cleanly and completely in order to prepare the case for the replacement label that will be applied at the completion of this procedure. A heat gun is useful in removing the label.

2. Remove batteries.
3. Remove the 3 back case screws.
4. With the pump lying on its face, remove the back case.
5. Replace the curtain on the back case and set the back case aside.
6. Replace the curtain on the front case.
7. Proceed to Chapter 7 for Calibration procedures.
8. Attach the case halves while holding battery door in its channel for positioning.

Caution: When reattaching the back case, use the three screws provided and take care not to bend or crimp the ribbon cable attached to the J1 connector or any other wires.

---

9. Attach a new instruction label (order separately).
10. Replace batteries.
11. Proceed to Chapter 3 for Simulated Use and Performance Checks.

6.2.4 Rear Case Assembly

6.2.4.1 Materials

- 1 Rear case Assembly
- 2 Curtains
- 3 No 6 Case Screws

6.2.4.2 Procedure

1. Remove the instruction label from the back case.

   The label should be removed cleanly and completely in order to prepare the case for the replacement label that will be applied at the completion of this procedure. A heat gun is useful in removing the label.

2. Remove batteries.
3. Remove the 3 back case screws.
4. With the pump lying on its face, remove and discard the damaged back case.
5. If the pump has a buzzer mounted on the chassis, remove it and discard.

   A new buzzer is premounted on the new back case.

6. Reconnect:
   - the buzzer connector at J6, and
   - the power connector at J3, with the orange and red leads of both connections towards motor.
7. Proceed to Chapter 7 for Calibration procedures.
8. Attach the case halves while holding the battery door in its channel for positioning.

Caution: When reattaching the back case, use the three screws provided and take care not to bend or crimp the ribbon cable attached to the J1 connector or any other wires.

9. Attach a new instruction label (order separately)./
10. Replace batteries.
11. Proceed to Chapter 3 for Simulated Use and Performance Checks.

6.2.5 Battery Door

6.2.5.1 Materials

- Battery Door with Positive Battery Terminal

6.2.5.2 Procedure

1. Remove the instruction label from the back case.

   The label should be removed cleanly and completely in order to prepare the case for the replacement label that will be applied at the completion of this procedure. A heat gun is useful in removing the label.

2. Remove batteries.
3. Remove the 3 back case screws.
4. Proceed to Chapter 7 for Calibration procedures.
5. Attach the case halves while holding the battery door in its channel for positioning.

Caution: When reattaching the back case, use the three screws provided and take care not to bend or crimp the ribbon cable attached to the J1 connector or any other wires.

6. Attach a new instruction label (order separately).
7. Replace batteries.
8. Proceed to Chapter 3 for Simulated Use and Performance Checks.

6.2.6 Wired Battery Terminal

6.2.6.1 Materials

- Wired battery Treminal

6.2.6.2 Procedure

1. Remove the instruction label from the back case.

   The label should be removed cleanly and completely in order to prepare the case for the replacement label that will be applied at the completion of this procedure. A heat gun is useful in removing the label.

2. Remove batteries.
3. Remove the 3 back case screws.
4. With the pump lying on its face, remove the back case.
5. Remove:
   - the buzzer connector at J6, and
   - the power connector at J3.
6. Remove the damaged battery terminal and discard.
7. If necessary, trim back case so there is clearance between the positive end of the battery terminal and the back case. Do not crimp the terminal's metal contact.
8. Slide the positive end of the battery terminal onto its mounting location on the back case.
9. Pinch the metal contact on the negative end of the battery terminal and slide it onto the post portion of the battery compartment spring.
10. Reconnect:
    - the buzzer connector at J6, and
    - the power connector at J3, with the orange and red leads of both connections towards motor.
11. Proceed to Chapter 7 for Calibration procedures.
12. Attach the case halves while holding the battery door in its channel for positioning.

Caution: When reattaching the back case, use the three screws provided and take care not to bend or crimp the ribbon cable attached to the J1 connector or any other wires.

13. Attach a new instruction label (order separately).
14. Replace batteries.
15. Proceed to Chapter 3 for Simulated Use and Performance Checks.

6.2.7 Instruction Label

6.2.7.1 Materials

- Instruction Label

6.2.7.2 Procedure

1. Remove the instruction label from the back case.

   The label should be removed cleanly and completely in order to prepare the case for the replacement label that will be applied at the completion of this procedure. A heat gun is useful in removing the label.

2. Remove batteries.
3. Attach the new instruction label.
4. Replace Batteries.

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6.2.8 PC Board

6.2.8.1 Materials

- 1 PC Board per Revision
- 2 Support Cushions per Revision

6.2.8.2 Procedure

1. Remove the instruction label from the back case.

   The label should be removed cleanly and completely in order to prepare the case for the replacement label that will be applied at the completion of this procedure. A heat gun is useful in removing the label.

2. Remove batteries.
3. Remove the 3 back case screws.
4. With the pump lying on its face, remove the back case.
5. Remove:
   - the buzzer connector at J6, and
   - the power connector at J3.
6. Remove the chassis by:
   - disconnecting the motor connector at J5,
   - the switch panel connector at J1,
   - the clamp block connector at J2, and the resistor strip connector at J4.

   Set the chassis aside.
7. Remove the 2 screws that hold the PC board in place

   Set the front case aside.
8. Discard the damaged PC board.
9. Install the new PC board into the front case. Reinstall the chassis.
10. Reconnect:
    - the motor connector at J5 with the red lead towards motor,
    - the switch panel connector at J1, the clamp block connector at J2, and
    - the resistor strip connector at J4.
11. Reconnect:
    - the buzzer connector at J6, and
    - the power connector at J3, with the orange and red leads of both connections towards motor.
12. Proceed to Chapter 7 for Calibration procedures.

13. Attach the back case while holding the battery door in its channel for positioning.

CAUTION: When reattaching the back case, use the three screws provided and take care not to bend or crimp the ribbon cable attached to the J1 connector or any other wires.

14. Attach a new instruction label (order separately).
15. Replace batteries.
16. Proceed to Chapter 3 for Simulated Use and Performance Checks.

6.2.9 EPROM

ATTENTION: For all old revisions, B.Braun should remove the obsolete EPROMs.

6.2.9.1 Materials

- Programmed EPROM per Revision

6.2.9.2 Procedure:

1. Remove the instruction label from the back case.

   The label should be removed cleanly and completely in order to prepare the case for the replacement label that will be applied at the completion of this procedure. A heat gun is useful in removing the label.

2. Remove batteries.
3. Remove the 3 back case screws.
4. With the pump lying on its face, remove the back case.
5. Remove:
   - the buzzer connector at J6, and
   - the power connector at J3.
6. Remove the chassis by:
   - disconnecting the motor connector at J5,
   - the switch panel connector at J1,
   - the clamp block connector at J2, and
   - the resistor strip connector at J4.

Set the chassis aside.

7. Carefully remove the EPROM.
8. Install the new EPROM, making sure the orientation is correct (note the notch on the EPROM and the orientation indicator marking on the PC board). Do not bend the EPROM's pins.
9. Reinstall the chassis.
10. Reconnect:
    - the motor connector at J5 with the red lead towards motor,
    - the switch panel connector at J1,
    - the clamp block connector at J2, and
    - the resistor strip connector at J4.
11. Reconnect:
    - the buzzer connector at J6, and
    - the power connector at J3, with the orange and red leads of both connections towards motor.
12. Proceed to Chapter 7 for Calibration procedures.
13. Attach back case while holding the battery door in its channel for positioning.

CAUTION: When reattaching the back case, use the three screws provided and take care not to bend or crimp the ribbon cable attached to the J1 connector or any other wires.

14. Attach a new instruction label (order separately).
15. Replace batteries.
16. Proceed to Chapter 3 for Simulated Use and Performance Checks.

6.2.10 Microprocessor

6.2.10.1 Materials

- Microprocessor

6.2.10.2 Procedure:

1. Remove the instruction label from the back case.

   The label should be removed cleanly and completely in order to prepare the case for the replacement label that will be applied at the completion of this procedure. A heat gun is useful in removing the label.

2. Remove batteries.
3. Remove the 3 back case screws.
4. With the pump lying on its face, remove the back case.
5. Remove:
   - the buzzer connector at J6,
   - and the power connector at J3.
6. Carefully remove the microprocessor.
7. Install the new microprocessor.

   Make sure the orientation is correct (note the notch on the microprocessor and the orientation indicator marking on the PC board). Do not bend the microprocessor's pins.

8. Reconnect:
   - the buzzer connector at J6, and
   - the power connector at J3, with the orange and red leads of both connections towards motor.
9. Proceed to Chapter 7 for Calibration procedures.
10. Attach the back case while holding the battery door in its channel for positioning.

CAUTION: When reattaching the back case, use the three screws provided and take care not to bend or crimp the ribbon cable attached to the J1 connector or any other wires.

---

11. Attach a new instruction label (order separately) and replace batteries.
12. Proceed to Chapter 3 for Simulated Use and Performance Checks.

6.2.11 LCD

6.2.11.1 Materials

- 1 LCD
- 2 Support Cushions

6.2.11.2 Procedure:

1. Remove the instruction label from the back case.

   The label should be removed cleanly and completely in order to prepare the case for the replacement label that will be applied at the completion of this procedure. A heat gun is useful in removing the label.

2. Remove batteries.
3. Remove the 3 back case screws.
4. With the pump lying on its face, remove the back case.
5. Remove:
   - the buzzer connector at J6,
   - and the power connector at J3.
6. Remove the chassis by:
   - disconnecting the motor connector at J5,
   - the switch panel connector at J1,
   - the clamp block connector at J2, and
   - the resistor strip connector at J4.

   Set the chassis aside.
7. Remove the 2 screws that hold the PC board in place.

   Set the front case aside.
8. Remove the LCD support cushions from the PC board and discard.

   This operation facilitates removal of the LCD.
9. Slide the damaged LCD straight back out of its socket and discard.

ATTENTION: Some devices may require to desolder 34 pins of LCD connector.

10. Install the new LCD and support cushions.

    Solder new LCD into place aligning the board between the hole marked "BP" next to the "0" and the hole marked "BP" next to the "60".

11. Reinstall the PC board into the front case.
12. Reinstall the chassis.
13. Reconnect:
    - the motor connector at J5 with the red lead towards motor,
    - the switch panel connector at J1,
    - the clamp block connector at J2, and
    - the resistor strip connector at J4.
14. Reconnect:
    - the buzzer connector at J6, and
    - the power connector at J3, with the orange and red leads of both connections towards motor.
15. Proceed to Chapter 7 for Calibration procedures.
16. Attach the back case while holding the battery door in its channel for positioning.

CAUTION: When reattaching the back case, use the three screws provided and take care not to bend or crimp the ribbon cable attached to the J1 connector or any other wires.

17. Attach a new instruction label (order separately) and replace batteries.
18. Proceed to Chapter 3 for Simulated Use and Performance Checks.

6.2.12 LCD Display Driver

6.2.12.1 Materials

- 1 LCD Display Driver
- 2 Support Cushions

6.2.12.2 Procedure:

1. Remove the instruction label from the back case.

   The label should be removed cleanly and completely in order to prepare the case for the replacement label that will be applied at the completion of this procedure. A heat gun is useful in removing the label.

2. Remove batteries.
3. Remove the 3 back case screws.
4. With the pump lying on its face, remove the back case.
5. Remove:
   - the buzzer connector at J6, and
   - the power connector at J3.
6. Remove the chassis by disconnecting:
   - the motor connector at J5,
   - the switch panel connector at J1,
   - the clamp block connector at J2, and
   - the resistor strip connector at J4.

   Set the chassis aside.
7. Remove the 2 screws that hold the PC board in place

   Set the front case aside.
8. Remove the LCD support cushions from the PC board and discard.

   This operation facilitates removal of the LCD.
9. Slide the LCD straight back out of its socket and set aside.

⚠ ATTENTION: Some devices may require to desolder 34 pins of the LCD connector.

---

10. Remove the LCD driver from PCB by desoldering all pins.
11. Install the new U5 chip.

Make sure the orientation is correct (note the notch on the chip and the orientation indicator marking on the PC board). Bend over all pins so as not to damage the LCD.

12. Solder U5 in place.

    Trim U5 lead to 0.020" maximum before installing LCD.

ATTENTION: If the PC board displays part number PD-7790, ensure there is a jumper wire from pin 0 of the LCD connector to pin 32 of the display driver U5.

13. Clean the PC board.
14. Reinstall the LCD.
15. Reinstall the PC board into the front case.
16. Reinstall the chassis.
17. Reconnect:
    - the motor connector at J5 with the red lead towards motor,
    - the switch panel connector at J1,
    - the clamp block connector at J2, and
    - the resistor strip connector at J4.
18. Reconnect:
    - the buzzer connector at J6, and
    - the power connector at J3, with the orange and red leads of both connections towards motor.
19. Proceed to Chapter 7 for Calibration procedures.
20. Attach the back case while holding the battery door in its channel for positioning.

CAUTION: When reattaching the back case, use the three screws provided and take care not to bend or crimp the ribbon cable attached to the J1 connector or any other wires.

21. Attach a new instruction label (order separately)
22. Replace batteries.
23. Proceed to Chapter 3 for Simulated Use and Performance Checks.

6.2.13 Crystal

6.2.13.1 Materials

- Quartz Crystal

6.2.13.2 Procedure:

1. Remove the instruction label from the back case.

   The label should be removed cleanly and completely in order to prepare the case for the replacement label that will be applied at the completion of this procedure. A heat gun is useful in removing the label.

2. Remove batteries.
3. Remove the 3 back case screws.
4. With the pump lying on its face, remove the back case.
5. Remove:
   - the buzzer connector at J6, and
   - the power connector at J3.
6. Remove the chassis by disconnecting:
   - the motor connector at J5,
   - the switch panel connector at J1,
   - the clamp block connector at J2, and
   - the resistor strip connector at J4.

   Set the chassis aside.

7. Remove the 2 screws that hold the PC board in place.

   Set the front case aside.

8. Desolder the damaged crystal from PCB and discard. Clean all contact holes.
9. Install the new crystal with the body of the crystal aligned within the area marked on the PC board.

   The crystal should lay flat with the terminals facing the inside of the PC board and the double sided tape facing the outside of the PC board. Solder in place.

10. Reinstall the PC board into the front case.
11. Reinstall the chassis.
12. Reconnect:
    - the motor connector at J5 with the red lead towards motor,
    - the switch panel connector at J1,

- the clamp block connector at J2, and
- the resistor strip connector at J4.

13. Reconnect:
    - the buzzer connector at J6, and
    - the power connector at J3, with the orange and red leads of both connections towards motor.
14. Proceed to Chapter 7 for Calibration procedures.
15. Attach the back case while holding the battery door in its channel for positioning.

CAUTION: When reattaching the back case, use the three screws provided and take care not to bend or crimp the ribbon cable attached to the J1 connector or any other wires.

16. Attach a new instruction label (order separately).
17. Replace batteries.
18. Proceed to Chapter 3 for Simulated Use and Performance Checks.

6.2.14 Buzzer

6.2.14.1 Materials

- Buzzer

6.2.14.2 Procedure:

1. Remove the instruction label from the back case.

   The label should be removed cleanly and completely in order to prepare the case for the replacement label that will be applied at the completion of this procedure. A heat gun is useful in removing the label.

2. Remove batteries.
3. Remove the 3 back case screws.
4. With the pump lying on its face, remove the back case.
5. Remove:
   - the buzzer connector at J6, and
   - the power connector at J3.
6. Carefully remove the old buzzer and discard.
7. Install the new buzzer in the alternate mounting located on the back case.

   Use a flat-tipped soldering tool or equivalent to slightly melt the mounting posts and secure the buzzer.

8. Reconnect:
   - the buzzer connector at J6, and
   - the power connector at J3, with the orange and red leads of both connections towards motor.
9. Proceed to Chapter 7 for Calibration procedures.
10. Attach the back case while holding the battery door in its channel for positioning.

CAUTION: When reattaching the back case, use the three screws provided and take care not to bend or crimp the ribbon cable attached to the J1 connector or any other wires.

ATTENTION: Some units may have the buzzer mounted to the chassis. In this case, remove the screw holding the damaged buzzer in place, discard the buzzer, and install the new buzzer in the same location. Cut off one of the new buzzer's mounting arms for fit.

11. Attach a new instruction label (order separately).
12. Replace batteries.
13. Proceed to Chapter 3 for Simulated Use and Performance Checks.

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6.2.15 Motor With Gear

6.2.15.1 Materials

- 1 Motor Gear and Set Screw
- 1 Motor
- 3 Motor Screws
- LOCTITE® 242

6.2.15.2 Procedure:

1. Remove the instruction label from the back case.

   The label should be removed cleanly and completely in order to prepare the case for the replacement label that will be applied at the completion of this procedure. A heat gun is useful in removing the label.

2. Remove batteries.
3. Remove the 3 back case screws.
4. With the pump lying on its face, remove the back case.
5. Remove:
   - the buzzer connector at J6, and
   - the power connector at J3.
6. Remove the chassis by disconnecting:
   - the motor connector at J5,
   - the switch panel connector at J1,
   - the clamp block connector at J2, and
   - the resistor strip connector at J4.

   Set the chassis aside.
7. Remove the old motor gear and discard.
8. Remove the 3 motor screws and discard the damaged motor.

ATTENTION: If you can not remove the .035" set screw, pry the gear off with a pair of pliers.

9. Install the new motor, making sure to align the flat of the motor shaft with the notch in the chassis.
10. Install the new motor gear.
    - Place a drop of LOCTITE® 242 on the .035" set screw.

- Slide the motor gear onto the shaft so that the .035" set screw lines up with the flat on the shaft and the gear is aligned with its mating gear.
- Tighten the set screw.

11. Reinstall the chassis.
12. Reconnect:
    - the motor connector at J5 with the red lead towards motor,
    - the switch panel connector at J1,
    - the clamp block connector at J2, and
    - the resistor strip connector at J4.
13. Reconnect:
    - the buzzer connector at J6, and
    - the power connector at J3, with the orange and red leads of both connections towards motor.
14. Proceed to Chapter 7 for Calibration procedures.
15. Attach back case while holding the battery door in its channel for positioning.

CAUTION: When reattaching the back case, use the three screws provided and take care not to bend or crimp the ribbon cable attached to the J1 connector or any other wires.

16. Attach a new instruction label (order separately).
17. Replace batteries.
18. Proceed to Chapter 3 for Simulated Use and Performance Checks.

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6.2.16 Clamp Block

6.2.16.1 Materials

- Clamp Block Assembly
- Clamp Block Wiper

6.2.16.2 Procedure:

1. Remove the instruction label from the back case.

   The label should be removed cleanly and completely in order to prepare the case for the replacement label that will be applied at the completion of this procedure. A heat gun is useful in removing the label.

2. Remove batteries.
3. Remove the 3 back case screws.
4. With the pump lying on its face, remove the back case.
5. Remove:
   - the buzzer connector at J6, and
   - the power connector at J3.
6. Remove the chassis by disconnecting:
   - the motor connector at J5,
   - the switch panel connector at J1,
   - the clamp block connector at J2, and
   - the resistor strip connector at J4.

   Set the case front aside.
7. Loosen the set screw (1/16") on the clamp collar.

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1. Remove the collar, spring, and washer, along with the clamp.

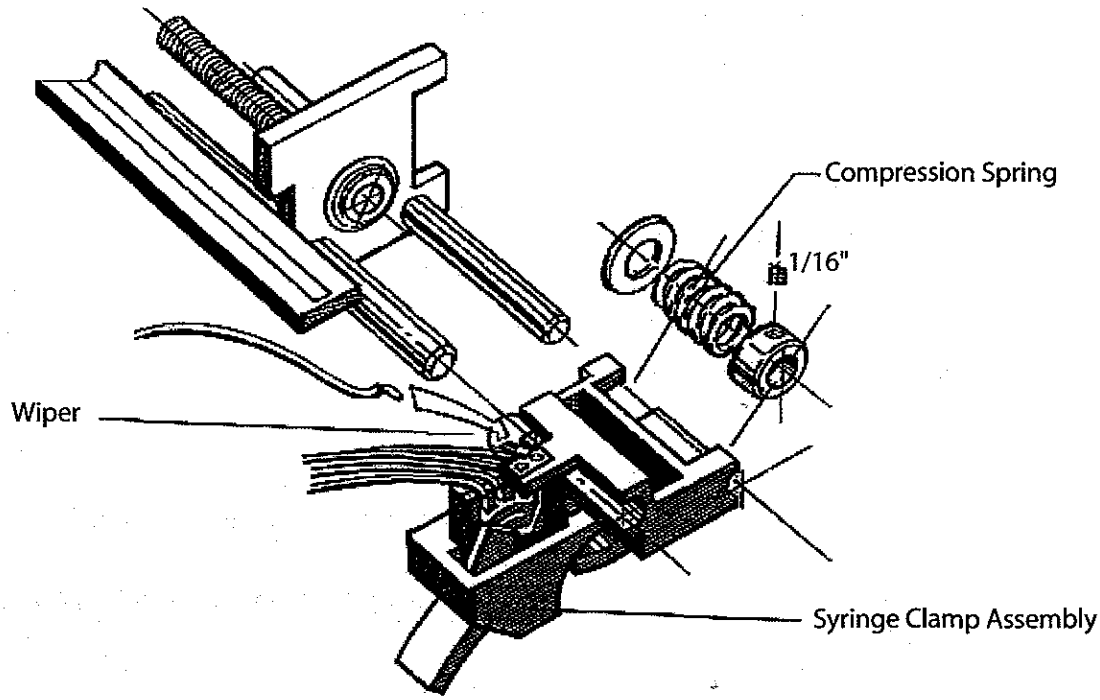

Figure 6-2: Clamp Block

2. Remove any grease remaining on the clamp end of the chassis rods.
3. Discard damaged clamp.
4. Check the bottom rod for burrs by sliding the collar along the rod.
   - Remove any burrs using a flat file.
   - Lightly relubricate the rods after filing.
5. Attach the new wiper to the clamp by melting the plastic nibs located on the clamp.

   A flat-tipped soldering iron on a low setting is recommended. Care should be taken so as not to melt these nibs completely.
6. Slide the new clamp onto the rods.

   The clamp should slide on easily. Slide on the washer, the spring, and the collar (in that order). See Figure 8.
7. Position the clamp so that it is flush with the chassis end bracket and tighten the set screw located on the collar. Locate collar to remove all spring looseness.

CAUTION: Do not compress the spring when tightening the set screw. Compressing the spring will affect the occlusion pressure readings.

8. Reinstall the chassis.
9. Reconnect:
   - the motor connector at J5 with the red lead towards motor,
   - the switch panel connector at J1,
   - the clamp block connector at J2, and
   - the resistor strip connector at J4.
10. Proceed to Chapter 7 for Calibration procedures.
11. Reconnect:
   - the buzzer connector at J6, and
   - the power connector at J3, with the orange and red leads of both connections towards motor.
12. Attach the back case while holding the battery door in its channel for positioning.

CAUTION: When reattaching the back case, use the three screws provided and take care not to bend or crimp the ribbon cable attached to the J1 connector or any other wires.

13. Attach a new instruction label (order separately).
14. Replace batteries.
15. Proceed to Chapter 3 for Simulated Use and Performance Checks.

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6.2.17 Pusher Block

6.2.17.1 Materials

- 1 Pusher Block Assembly
- 1 Wiper

6.2.17.2 Procedure:

1. Remove the instruction label from the back case.

   The label should be removed cleanly and completely in order to prepare the case for the replacement label that will be applied at the completion of this procedure. A heat gun is useful in removing the label.

2. Remove batteries.
3. Remove the 3 back case screws.
4. With the pump lying on its face, remove the back case.
5. Remove:
   - the buzzer connector at J6, and
   - the power connector at J3.
6. Remove the chassis by disconnecting:
   - the motor connector at J5,
   - the switch panel connector at J1,
   - the clamp block connector at J2, and
   - the resistor strip connector at J4.

   Set the case front aside.
7. Loosen the set screw on the clamp collar.
8. Remove the collar, spring, and washer, along with the clamp block.

   Set the clamp block aside.
9. Move the damaged pusher block to the upper bracket end (top position).
10. Loosen the 2 set screws that hold the bottom guide rod (the one away from the resistor strip), and slide the bottom guide rod out about 2 inches from the upper bracket and out of the pusher block groove.

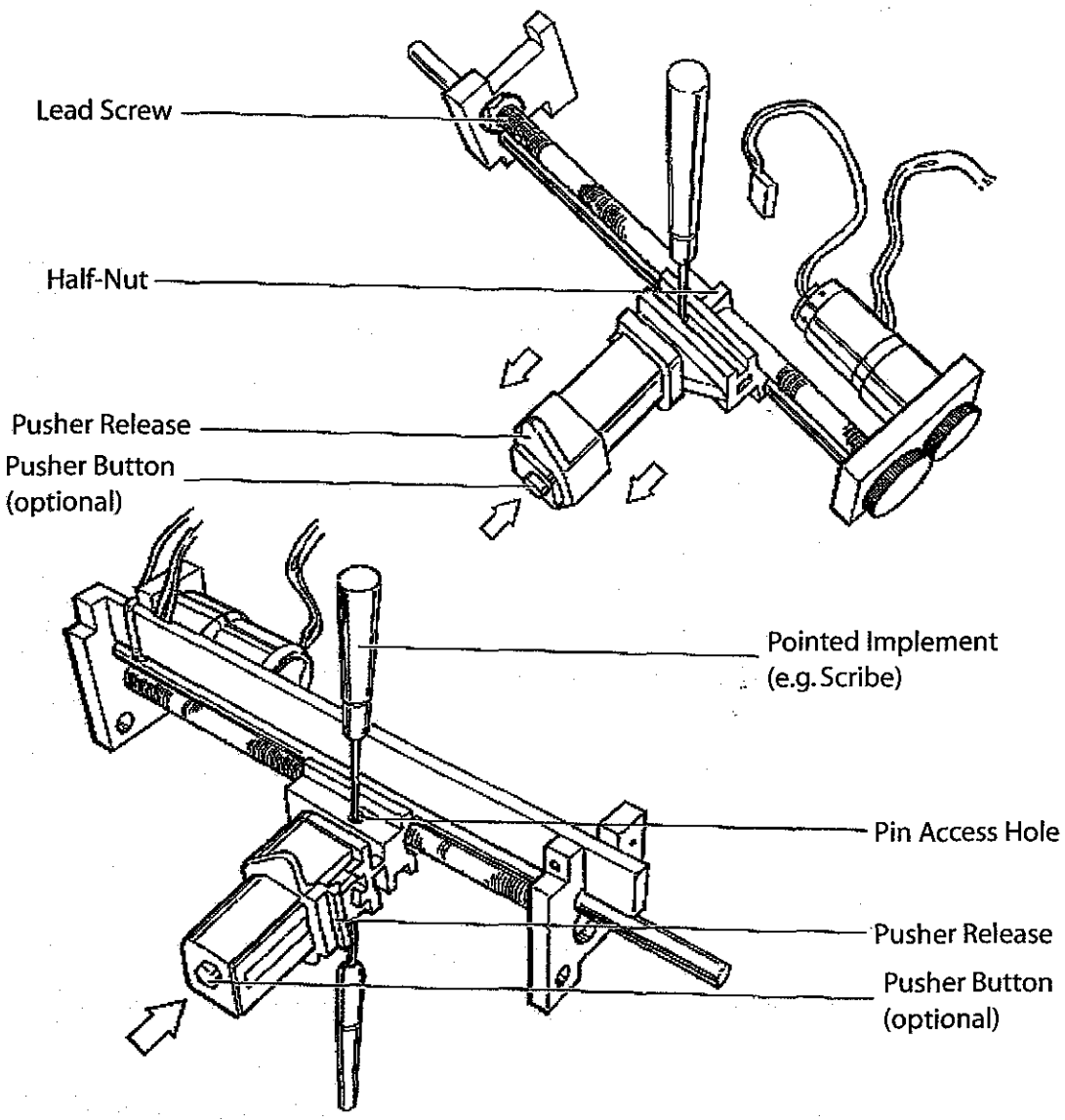

Figure 6-3: Pusher Block

11. Replace the wiper (facing the clamp).
12. Attach the wiper by melting the plastic nibs located on the pusher.

    A flat-tipped soldering iron on a low setting is recommended. Care should be taken so as not to melt these nibs completely.
13. Pull up the pusher release to keep the half nut away from lead screw and remove the damaged pusher block out of the chassis.

14. Position the pusher block with the wiper toward the clamp block.
    - Pull up the half nut (use the pusher release) and hook pusher block groove to the top guide rod.
    - Slide the bottom guide rod through the other side groove of the pusher block and into the hole on upper bracket.
15. Tighten 2 set screws that hold the bottom guide rod.
16. Reinstall the clamp block.
17. Reinstall the chassis.
18. Reconnect:
    - the motor connector at J5 with the red lead towards motor,
    - the switch panel connector at J1,
    - the clamp block connector at J2, and
    - the resistor strip connector at J4.
19. Proceed to Chapter 7 for Calibration procedures.
20. Reconnect:
    - the buzzer connector at J6, and
    - the power connector at J3, with the orange and red leads of both connections towards motor.
21. Attach the back case while holding the battery door in its channel for positioning.

CAUTION: When reattaching the back case, use the three screws provided and take care not to bend or crimp the ribbon cable attached to the J1 connector or any other wires.

22. Attach a new instruction label (order separately).
23. Replace batteries.
24. Proceed to Chapter 3 for Simulated Use and Performance Checks.

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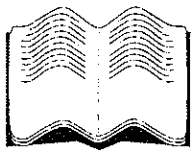
CHAPTER 7.0
CALIBRATION PROCEDURES



IN THIS CHAPTER YOU WILL LEARN:

- What equipment is required to complete these checks.
- How to perform a mechanical inspection and adjustment of the pump.

The test procedures detailed in this chapter should be performed on every opened unit to ensure the safety and efficiency of the 360infuser.

7.1 ALIGNMENT TEST PROCEDURES

7.1.1 Equipment Required

- **External Power Supply**, 5.5 + .050 VDC (Batteries cannot be used)
- **0 to 50 Amp Digital Voltmeter**, 0 to 10.000 VDC range .001 volts resolution
- **.365 inch spacer**

See Figure 5-2 for location of test points.

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7.1.2 Initial Set-up

1. Unit must be opened.
2. Determine that all connectors except the J3 battery connector are correctly connected. It should be snug, but not tight.
3. Connect a jumper between R43 (U4 side) and cathode of D10.

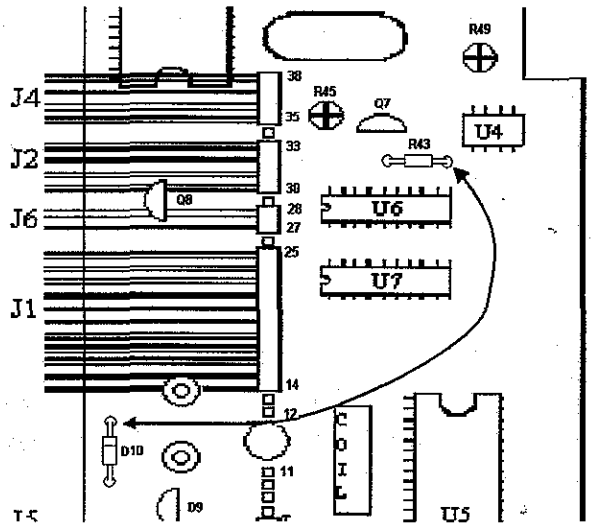

Figure 7-1: Jumper Location

4. Connect the power supply (in Off position) between Pin 2 (+) and Pin 3 (-).
5. Turn the Power supply on.

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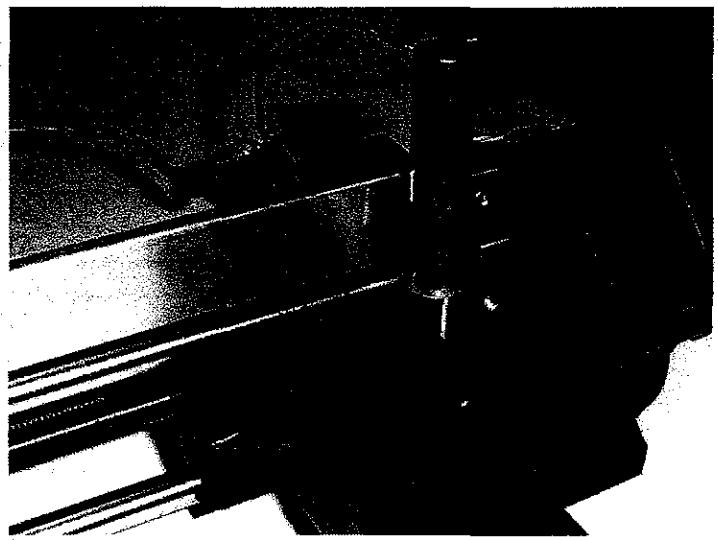
7.1.3 Home Position Alignment

1. Place the home position (.365 inch) spacer between the lower bracket and the pusher. Advance the pusher until it rests against the spacer. It should be snug, but not tight.



2. Depress Power On button.
3. Check voltage between Pin 35 and Pin 3 and record value.
4. Refer to the "Home Position Voltage Adjustment" table (Data Sheet 3A) to select the proper Home Position Voltage value for the particular Pin 35 voltage that was measured.
5. Connect the voltmeter between Pin 26 and Pin 3.
6. Adjust R45 until the reading on the Digital Voltmeter is equal to the value selected in step 4.

   For example, for a voltage at Pin 35 of 3.00 VDC, R 45 should be adjusted for a reading at Pin 26 of .621 + 0.003 VDC. See Data Sheet 7A.

Data Sheet 7A

Home Position Voltage Adjustment Table

TP35 Voltage	Home Position Voltage
2.91	.602 + 0.003
2.92	.605 + 0.003
2.93	.607 + 0.003
2.94	.609 + 0.003
2.95	.611 + 0.003
2.96	.613 + 0.003
2.97	.615 + 0.003
2.98	.617 + 0.003
2.99	.619 + 0.003
3.00	.621 + 0.003
3.01	.623 + 0.003
3.02	.625 + 0.003
3.03	.627 + 0.003
3.04	.629 + 0.003
3.05	.631 + 0.003
3.06	.633 + 0.003
3.07	.635 + 0.003
3.08	.637 + 0.003
3.09	.640 + 0.003
3.10	.642 + 0.003
3.11	.644 + 0.003
3.12	.646 + 0.003
3.13	.648 + 0.003
3.14	.650 + 0.003
3.15	.652 + 0.003
3.16	.654 + 0.003
3.17	.656 + 0.003

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7.1.4 Occlusion Adjustment

1. With the unit open and the clamp lubricated, measure the voltage between Pin 38 and Pin 3 with the Digital Voltmeter.

   Check that the voltage is between the tolerances 0.207 V and 0.250 V. See Data Sheet 7B.

2. Adjust R49 for the voltage between Pin 29 and Pin 3 to be equal to the value recorded above, +.00/-.01V.
3. Slide spring collar down snug on the spring and tighten the set screw.
4. Complete the Occlusion Tests in Chapter 3.
5. If both tests pass, continue on and complete the Simulated Use and Performance Checks. If the pump fails either test, adjust the tension on the spring appropriately and return to step .

ATTENTION: *If pressure readings are low add tension to the spring and if pressure readings are high remove tension from the spring.*

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Data Sheet 7B

Voltage between Pin 38 and Pin 3	Voltage X6
0.207	1.242
0.208	1.248
0.209	1.254
0.210	1.260
0.211	1.266
0.212	1.272
0.213	1.278
0.214	1.284
0.215	1.290
0.216	1.296
0.217	1.302
0.218	1.308
0.219	1.314
0.220	1.320
0.221	1.326
0.222	1.332
0.223	1.338
0.224	1.344
0.225	1.350
0.226	1.356
0.227	1.362
0.228	1.368
0.229	1.374
0.230	1.380
0.231	1.386
0.232	1.392
0.233	1.398
0.234	1.404
0.235	1.410
0.236	1.416
0.237	1.422
0.238	1.428
0.239	1.434
0.240	1.440
0.241	1.446
0.242	1.452
0.243	1.458
0.244	1.466
0.245	1.470
0.246	1.476
0.247	1.482
0.248	1.488
0.249	1.494
0.250	1.500

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